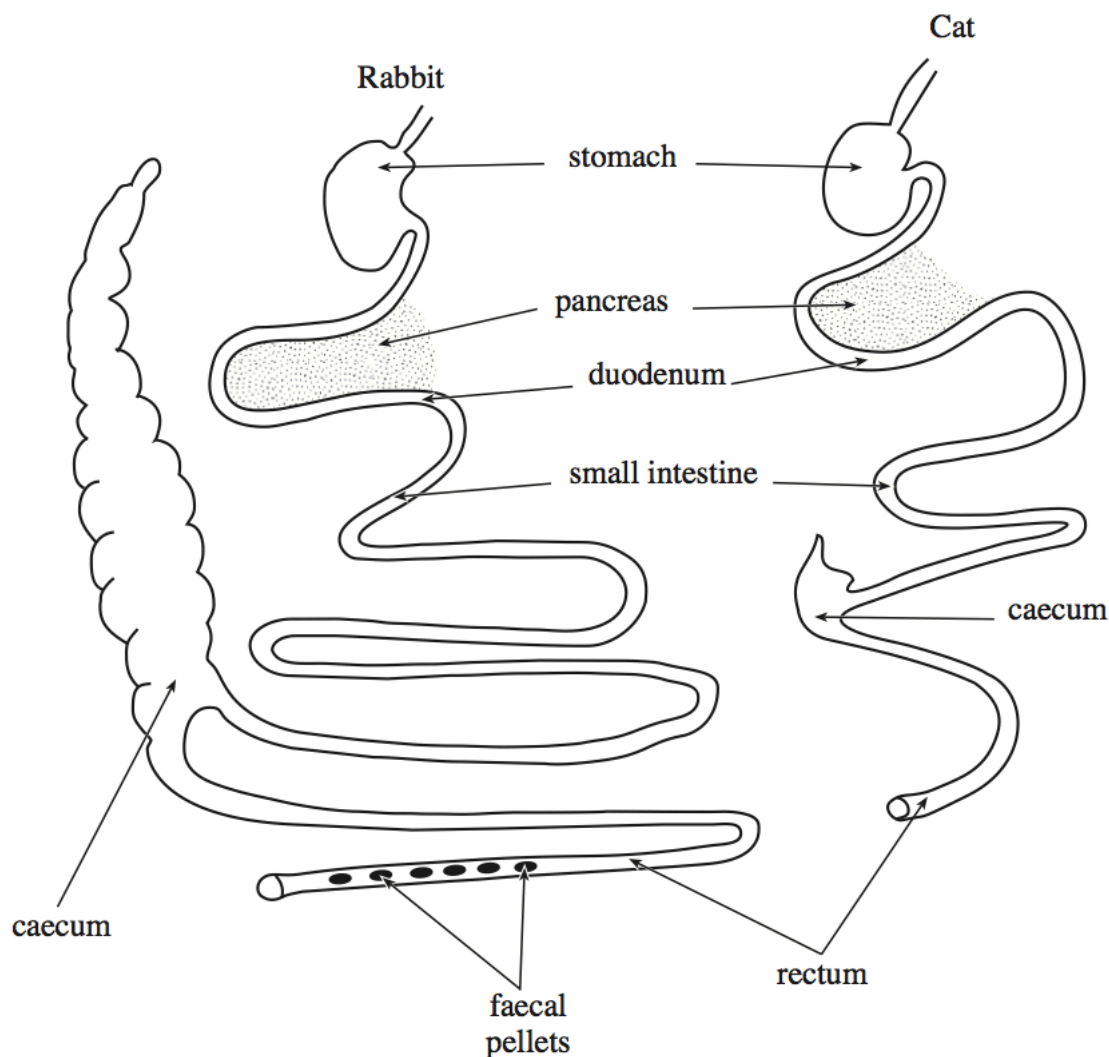


## Adaptations to Nutrition

1.

The two diagrams below show a comparison of the gut structure in a rabbit and a cat.



- (a) (i) State **two** structural differences between the cat and the rabbit gut that you can see in the diagram. [2]

1. ....

2. ....

- (ii) In a similar diagram of a human gut these features would be intermediate between those shown. Give a reason for this. [1]

.....

- (b) State **three** differences that can be seen when comparing the dentition of the cat and the rabbit. [3]

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- (c) The caecum is packed with bacteria. Explain why this is necessary and its importance to the rabbit. [2]

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.....

- (d) The diagram shows that the faeces of rabbits form distinct pellets in the rectum. These are eaten in a process called refection.

- (i) Suggest a reason for refection. [1]

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.....

- (ii) Cows feed in a similar way to rabbits but do not show refection. Explain this difference. [3]

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**(Total 12 marks)**

2.

The drawings show the skulls of two mammals.



**P**



**Q**

- (a) (i) Identify the mode of nutrition for each animal. [1]

**P** ..... **Q** .....

- (ii) For each animal, describe **one** adaptation of its dentition to its diet. [2]

**P** .....

.....

.....

**Q** .....

.....

.....

- (b) The table below compares the gut of animal **P** with that of animal **Q**.

<i>Gut Region</i>	<i>Animal P</i>	<i>Animal Q</i>
Stomach	Very large, divided into four chambers	Smaller than in <b>P</b> , but quite large compared to the volume of the rest of the gut.
Small intestine	Long	Short
Caecum	Short	Apparently absent
Colon	Medium length	Very short

- (i) Explain the significance of relative lengths of the gut in the two animals. [1]

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.....

(ii) Describe how the stomach of **P** is adapted to its diet. [4]

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(iii) Suggest why **Q** has a large stomach, even though the rest of its gut is reduced in length. [1]

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.....

.....

(iv) What evidence is there in the table to suggest that animal **P** is more able to absorb water than animal **Q**? [1]

.....

.....

3.

2. The table below lists various features of the human alimentary canal. Tick (✓) the boxes to show the region(s) where each feature occurs.

<i>Feature</i>	<i>Mouth</i>	<i>Stomach</i>	<i>Duodenum</i>	<i>Ileum</i>	<i>Large Intestine</i>
Villi present					
Site of mechanical breakdown of food					
Connects with bile duct					
Microorganisms secrete vitamins					
Carbohydrate digestion takes place					
pH 2-3					
Brunner's glands secrete alkaline fluid					
Main region of water absorption					
Protein digestion begins					

(Total 9 marks)

4.

An experiment was carried out to determine the effect of bile salts on the digestion of lipids. After equilibration at 37°C each tube contained:

1 cm<sup>3</sup> enzyme  
5 cm<sup>3</sup> full cream milk  
2 cm<sup>3</sup> sodium carbonate  
6 drops of phenolphthalein pH indicator.

Bile salts were added to tube B and boiled enzyme used in tube C.

In alkaline solutions above pH10 phenolphthalein indicator is pink.  
In solutions below pH 8.3 it is colourless.

The colour changes of the solutions are shown in the table below.

	<i>Tube A</i> <i>No bile salts</i>	<i>Tube B</i> <i>Plus bile salts</i>	<i>Tube C</i> <i>Boiled enzyme</i>
Initial colour of indicator in experiment	Pink	Pink	Pink
Colour of indicator after 5 minutes	Pink	Colourless	Pink
Colour of indicator after 10 minutes	Pink	Colourless	Pink
Colour of indicator after 15 minutes	Colourless	Colourless	Pink

(a) Name the enzyme used in this experiment. [1]

.....

(b) (i) Explain the change in colour of indicator from pink to colourless. [2]

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(ii) Using your knowledge of lipid digestion in the gut, explain the results seen in the tubes **A** and **B**. [3]

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(c) Explain fully the results of tube **C**. [3]

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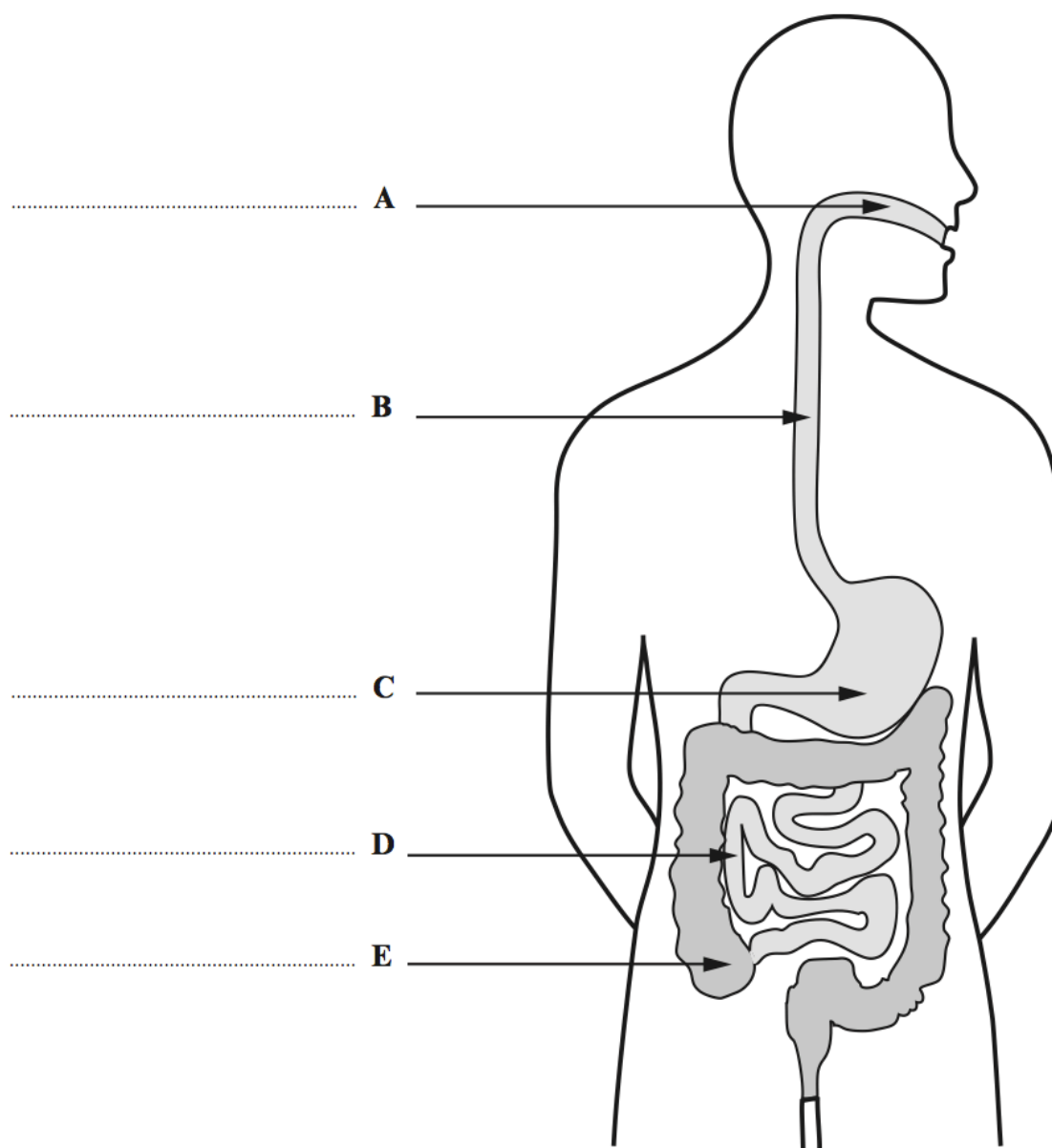
(d) Suggest why the experiment was carried out using full cream milk. [1]

.....

**(Total 10 marks)**

5.

1. The diagram below shows a simplified diagram of the human digestive system.



(a) Label parts A to E on the diagram. [1]

(b) Using letters from the diagram identify the **main** regions in the human gut where the following processes take place.

(i) Digestion .....

(ii) Absorption ..... [2]

(c) Explain why the human digestive system is divided into several regions. [1]

.....

.....



(d) The adult pork tapeworm, *Taenia solium*, is a parasite of the region labelled **D** on the diagram opposite.

(i) What is meant by the term *parasite*? [2]

.....

.....

.....

(ii) Suggest why it is of benefit to the tapeworm to live in this region of the digestive system. [1]

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.....

(e) Describe how tapeworms such as *Taenia solium* are adapted to overcome the following problems associated with living in the human digestive system. [2]

Peristalsis.

.....

.....

Digestive enzymes.

.....

.....

(f) Suggest why tapeworms produce large numbers of eggs. [1]

.....

.....

**(Total 10 marks)**

6.

Define the following terms and give an example of a different organism for each.

[6]

Parasite

.....

.....

Example .....

Autotroph

.....

.....

Example .....

Saprophyte or saprobiont

.....

.....

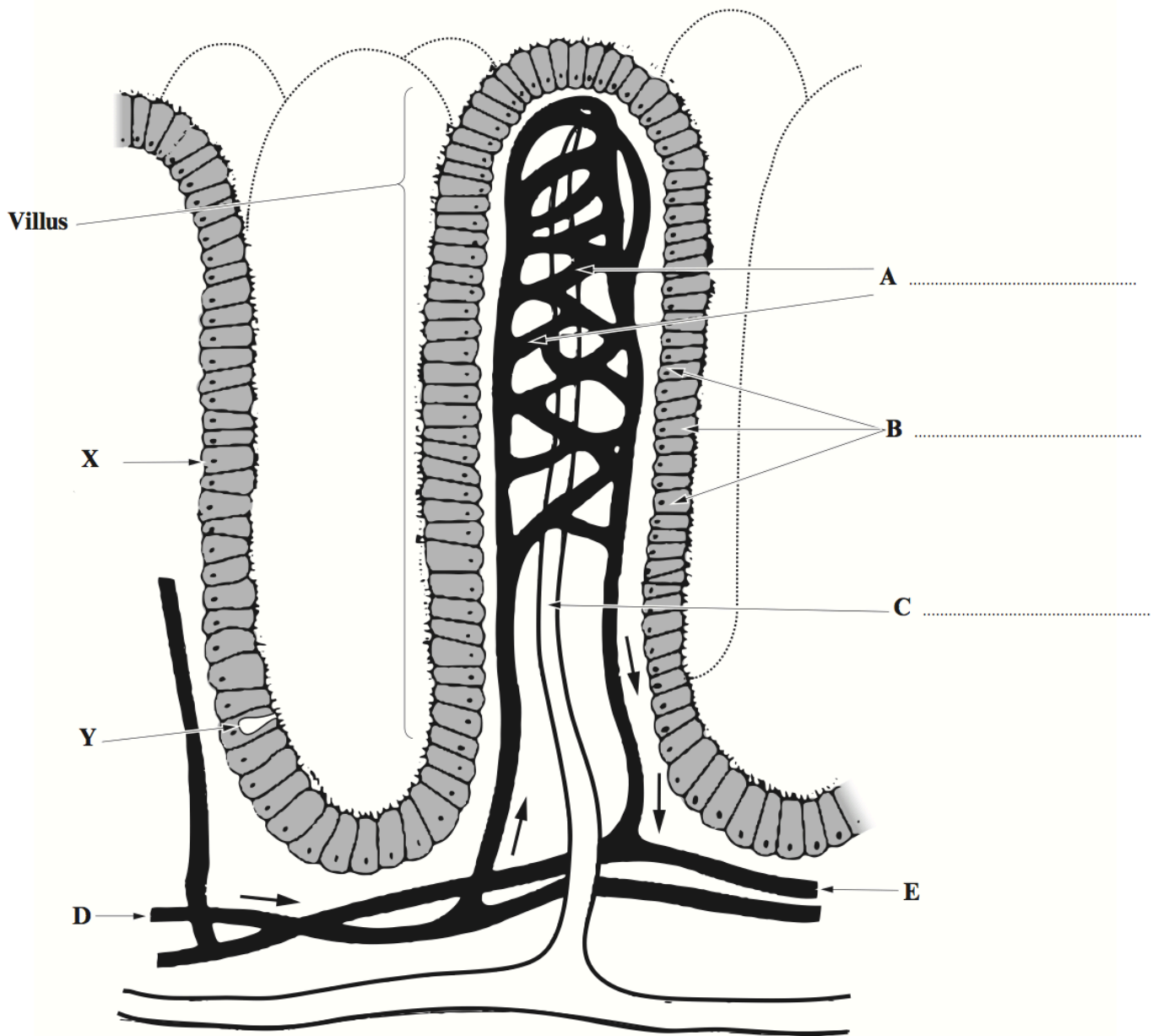
Example .....

**(Total 6 marks)**

7.

only

6. The following diagram shows a longitudinal section of the small intestine.



(a) Complete the diagram by labelling structures **A**, **B** and **C**.

[3]

(b) Identify the types of blood vessels shown by **D** and **E**.

[2]

**D** .....

**E** .....

- (c) Describe **two** features associated with cell **X** and explain why each is important for the cell to function efficiently. [4]

Feature 1 .....

Importance .....

.....

.....

Feature 2 .....

Importance .....

.....

.....

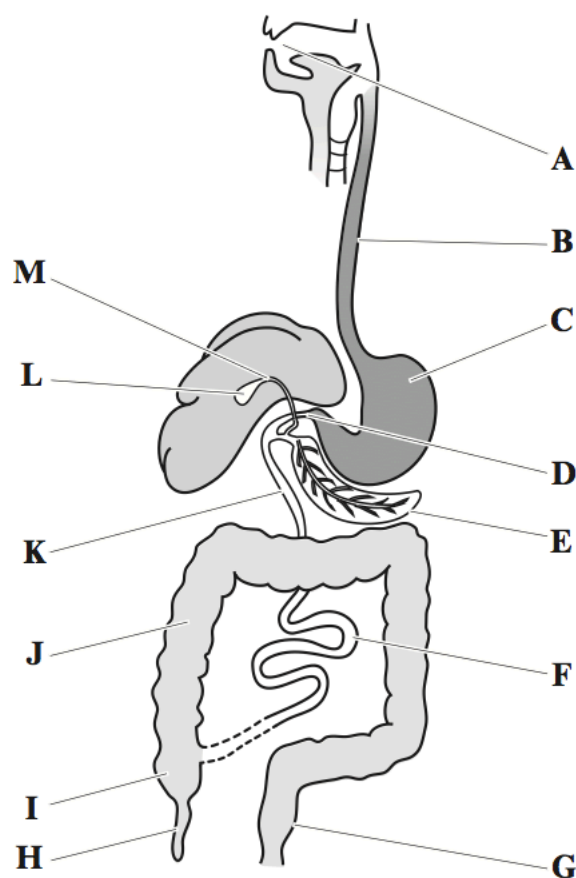
- (d) Cell **Y** is vital to the functioning of the intestine. What is the name of this cell and what is its function? [2]

Name .....

Function .....

**(Total 11 marks)**

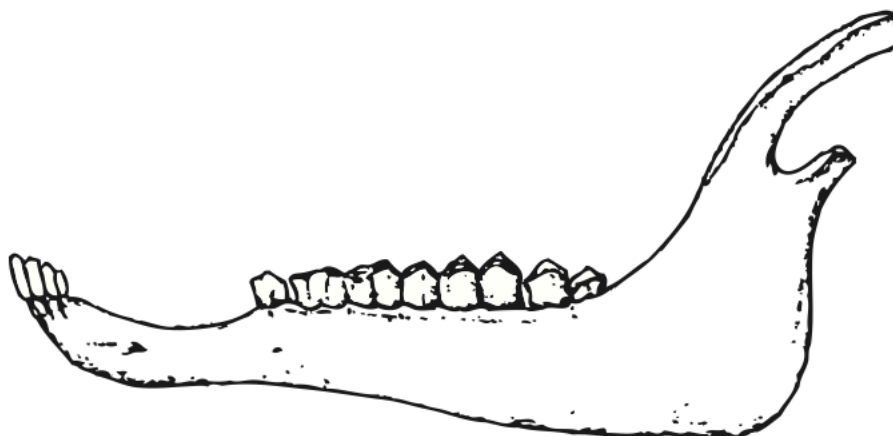
- 8.
4. The diagram below shows the human alimentary canal.



(a) Use a letter or letters from the diagram above to answer the following questions. [6]

(i)	Which is the most acidic region of the alimentary canal?	
(ii)	In which <b>two</b> areas are proteins, carbohydrates and lipids digested together?	
(iii)	Where does the process of protein digestion begin?	
(iv)	Where is the main site of lipase production?	
(v)	The section of the alimentary canal where most absorption of digested products occurs.	
(vi)	The section of the alimentary canal whose main function is to absorb water.	

The diagram below shows the lower jaw of a mammal.



(b) Use the information in the diagram above to:

(i) State the name given to describe the mode of nutrition of this mammal. [1]

.....

(ii) Explain how the jaw and teeth shown above are adapted for this mode of nutrition. [3]

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(iii) Explain how the **gut** of this mammal is adapted for digestion. [2]

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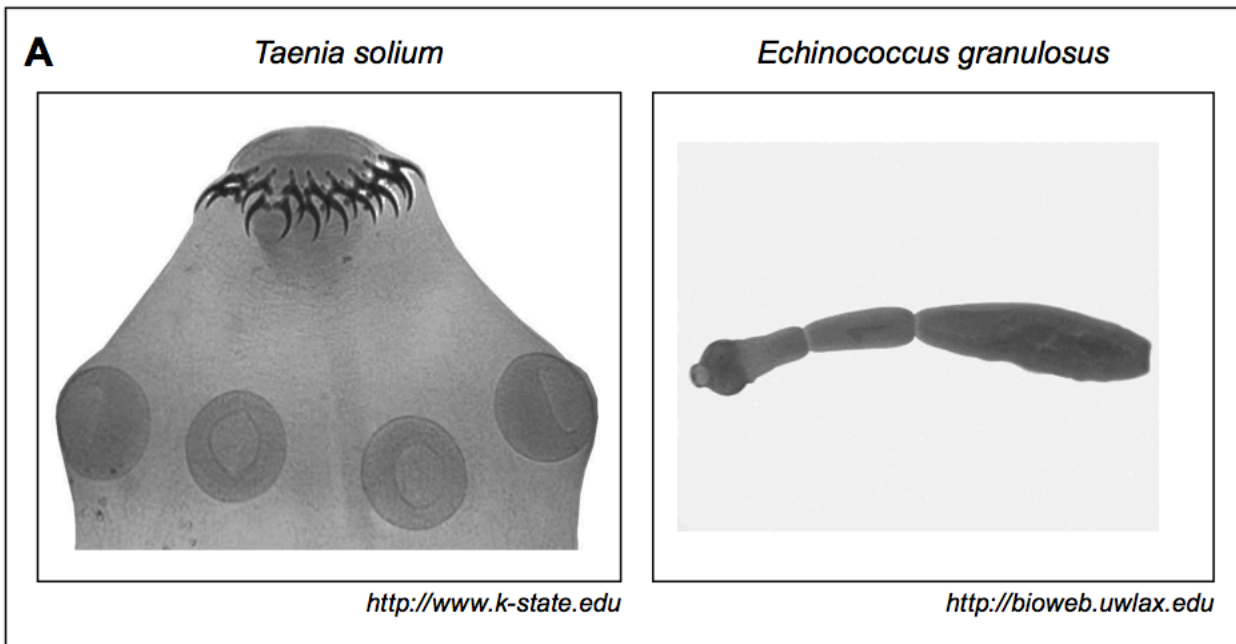
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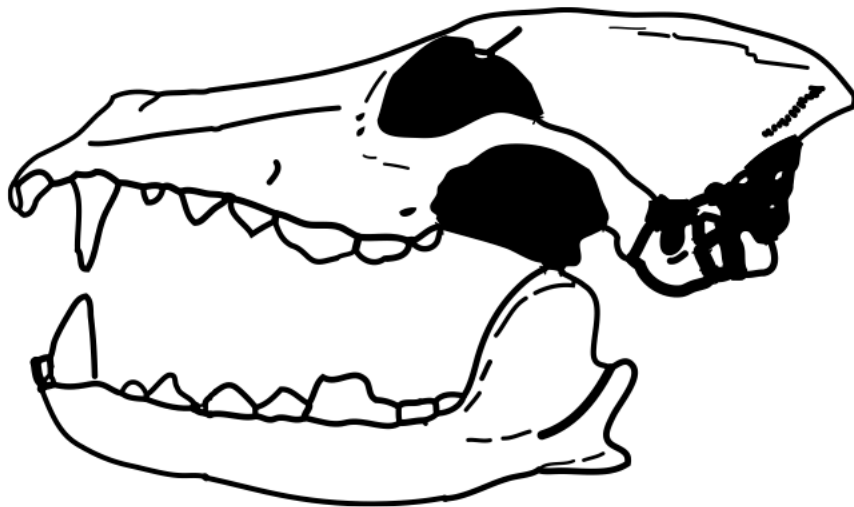
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9.

The diagrams below show the gut parasites *Taenia solium* and *Echinococcus granulosus* (A) and the skull of a mammal (B).



**B**



(a) (i) State what is meant by the term *parasite*.

[2]

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.....

.....

- (ii) Using the photographs in **A** opposite, and your own knowledge, state **three** features of the gut parasites that are adaptations to their parasitic way of life. [3]

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- (iii) State the type of diet eaten by the animal shown in diagram **B** opposite. Give reasons for your answer. [3]

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b) Explain how a parasitic mode of nutrition is

- (i) similar to the mode of nutrition used by the mammal in diagram **B** opposite, [1]

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- (ii) different from the mode of nutrition used by the mammal in diagram **B** opposite. [2]

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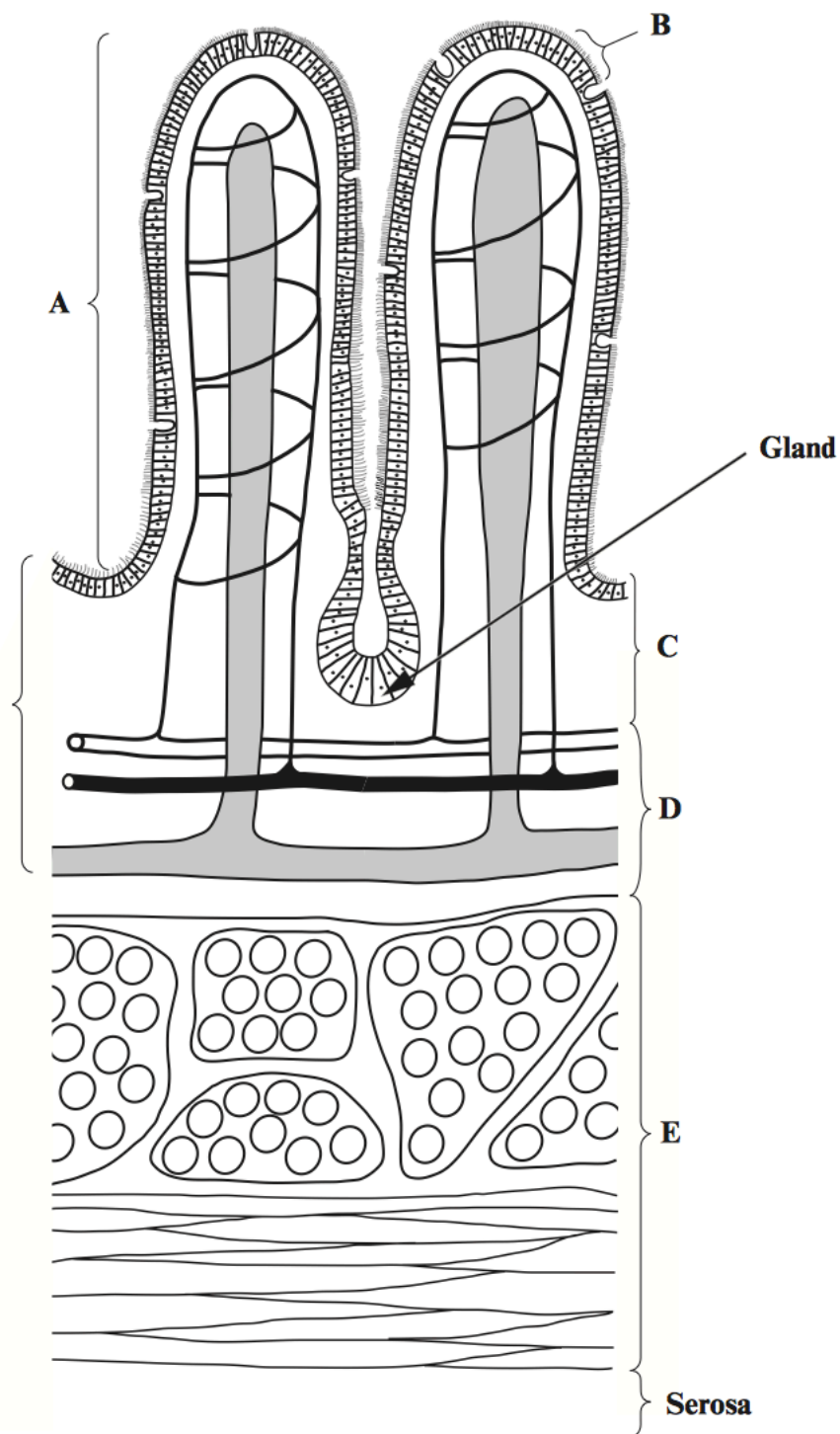
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10.

(a) The diagram shows a longitudinal section through a part of the alimentary canal.



(i) Name the part of the alimentary canal where structures A would be found. [1]

.....

(ii) Name the blood vessel that transports amino acids to the liver. [1]

.....

(iii) Use the diagram opposite to complete the following table.

[4]

Letter	Name	Function
<b>B</b>		increases surface area
<b>C</b>		contains glands that release secretions
<b>D</b>		contains vessels to transport products of digestion
<b>E</b>	muscle layer	

(b) Coeliac disease is a disease that affects the small intestine.  
Suggest why symptoms often include diarrhoea and fatigue.

[3]

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.....

11.

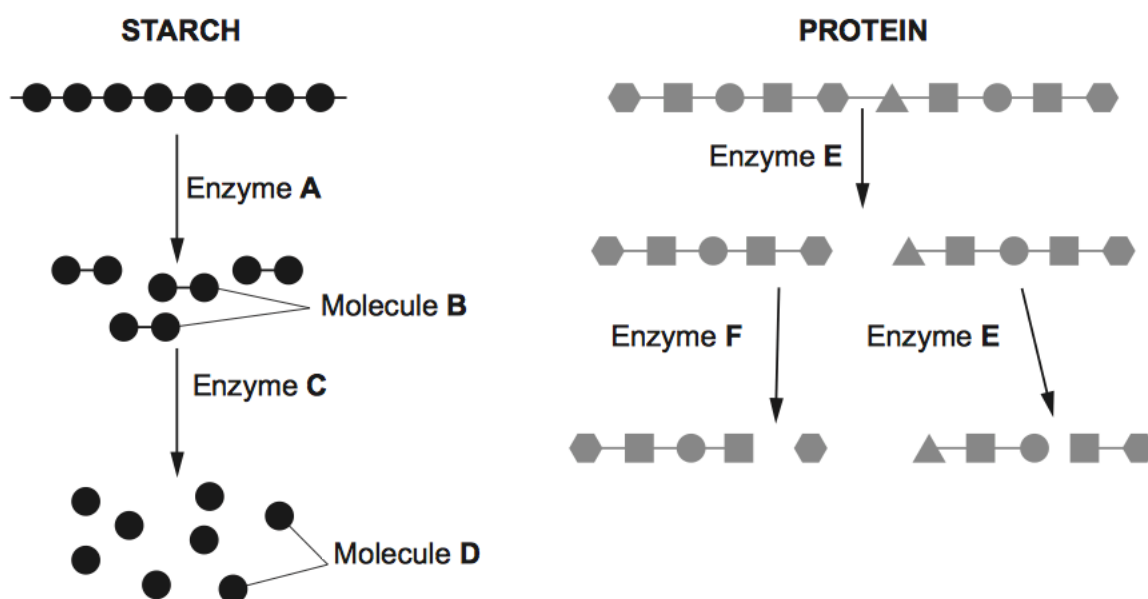
Digestion involves the breaking down of food by a combination of mechanical and chemical processes.

- (a) Describe **two** ways in which food is broken down **mechanically** in the human alimentary canal. [2]

I. ....

II. ....

- (b) The diagrams show the digestion of a molecule of starch and a molecule of protein.



- (i) In the digestion of starch name:

Enzymes **A** and **C**: [1]

**A** ..... **C** .....

Molecules **B** and **D**: [1]

**B** ..... **D** .....

- (ii) Name **two** places in the alimentary canal where digestion caused by enzyme **A** takes place. [1]

.....

- (c) (i) In the digestion of protein name the **types** of enzyme shown at **E** and **F**. [2]

**E** .....

**F** .....

- (ii) Pepsin and trypsin are enzymes involved in the digestion of proteins. Both are secreted as inactive precursors. Complete the table to give the names of the substances responsible for their activation. [2]

Enzyme	Name of precursor	Activated by
pepsin	pepsinogen	
trypsin	trypsinogen	

- (iii) *Helicobacter pylori* is a species of bacterium that lives in the stomach and digests urea into alkaline ammonia. Ammonia is toxic to epithelial cells lining the gastric pits (glands).

Suggest how infection with *H.pylori* can lead to the development of a peptic ulcer. [3]

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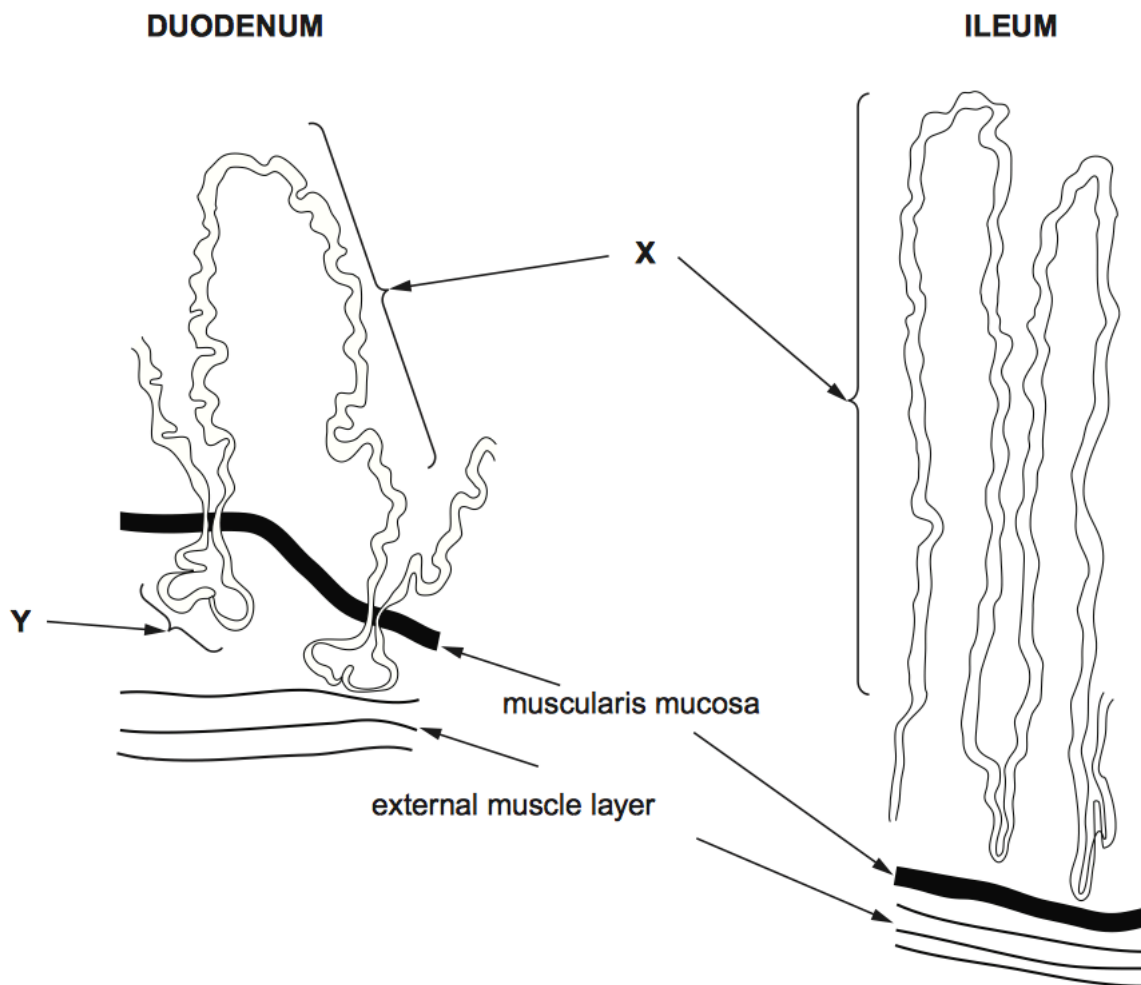
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12.

The diagrams below show sections through the duodenum and ileum at the same magnification.



(a) Name the structure labelled **X** in each diagram.

[1]

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(b) What is the **main** function of the regions of the alimentary canal shown in these diagrams?

[2]

**DUODENUM** .....

**ILEUM** .....

The duodenum receives food mixed with hydrochloric acid from the stomach.

- (c) (i) Suggest how secretions from structure **Y** affect the pH of the duodenum contents. [1]

- (ii) What effect would this have on the activity of the enzymes that pass into the duodenum from the stomach? [1]

- (d) (i) Suggest how the increased size of structure **X** in the ileum reflects its main function. [1]

- (ii) Describe **two** other adaptations of the ileum, **not** shown in the diagram, that increase the efficiency of this function. [2]

- (e) Describe the appearance of structure **X** in a person suffering from coeliac disease and explain how this can lead to weight-loss and fatigue. [3]

## Essays

1.

- (b) (i) Compare the dentition of a carnivore and a grazing herbivore.  
(ii) Describe how the gut region of a ruminant is adapted to its diet. [10]

2.

- (a) Give an account of the sequence of events that takes place during the digestion and absorption of a meal containing carbohydrate and protein. [10]

3.

- (b) Describe the digestion and absorption of proteins in humans. [10]

4.

- (b) Describe how, starting at the stomach, the **structure** of the alimentary canal enables it to perform the functions of digestion and absorption. (Details of specific enzymes are not required). [10]